HINTS TO FARMERS ON THE NATURE, PURCHASE, AND APPLICATION…

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HINTS TO FARMERS,

&c. &c.

Guano is said to be the excrement of sea-birds, and is found in great abundance on the small islands of the South American and south-western African coasts. Many islands in other parts of the globe also abound with it. This substance was known to the Peruvians long before the invasion of their country by the Spaniards, and at the time the Incas governed it, the birds were preserved with great care. The punishment of death was decreed against persons who landed on the island during breeding time, or frightened the birds, or at any time destroyed them. The culture of the barren sandy tracts extending along the Peruvian coast, was almost entirely dependent on the use of guano; and so highly was it prized, that overseers were appointed over the respective districts which produced it, whose business was to see it duly distributed and that no one defrauded his neighbour of his proper share.

This manure is deposited in such immense beds; in the Peruvian islands 50 or 60 feet thick, and in the African islands 25 to 30 feet thick; that it seems almost preposterous to suppose that it is formed entirely by birds; for from observations made, it appears that in 300 years they only deposited a *few lines* in thickness, showing that very many centuries must have elapsed since the commencement of these extraordinary formations, or, what seems more probable, that there were other means of accumulation. Now it is well known that the bones of small animals, birds, &c., are found amongst guano, and in 1828 it was estimated that about half a million of the carcases of seals were lying on Possession Island, and fully as many more on Seal and Penguin Islands in Angra Pequina Bay, which must either have fallen by some direful pestilence, or by a sand blast from the main land of Africa. These islands are but a short distance from thence, heavy squalls and gales of wind are frequent; and when the wind is off the shore, the sand, accompanied with intense heat, is blown over. If, then, the death of the seals is to be attributed to the burning sand, it is likely to be of very common occurrence, and it seems extremely probable that the decomposition of their bodies must add more to the formation of the guano heaps in a few years, than the mere deposits of the birds would in centuries.

Yet with all the notoriety that guano obtained in Peru for its fertilizing properties, it was reserved for Humboldt to introduce this singular manure into Europe. This occurred in 1804, and though Davy and others of our countrymen made experiments on a confined scale, it is only within the last three years that guano has been fairly appreciated.

Dr. Ure observes that " Genuine Peruvian and Bolivian guanos, like those which I have minutely analyzed for Messrs. Myers, of Liverpool, surpass very far all other species of manure, whether natural or artificial, in the quantity of *potential* ammonia: and, therefore, in the permanency of their action upon the roots of plants, while, in consequence of the ample store of *actual* ammonia which they contain ready formed, they are qualified to give immediate vigour to vegetation. Urate of ammonia constitutes a considerable portion of the azotized organic matter in well preserved guano; it is nearly insoluble in water, not at all volatile, and is capable of yielding to the soil, by its slow decomposition, nearly one-third of its weight of ammonia. No other manure can rival this animal saline compound. One of the said samples of guano afforded me no less than 17 per cent of potential ammonia, besides 4½ per cent of the actual or ready formed; others from 7 to 8 per cent of ammonia, in each of these states respectively.

"The guanos of Messrs. MYERS, which I have examined, are the mere excrement of birds, and are quite free from sand, earth, clay, and common salt, reported in the analyses of some guanos, and one of which (sand) to the amount of 30 per cent, I found myself in a sample of guano from Chili.

"The Peruvian guano, moreover, contains from 20 to 30 per cent of phosphate of lime, the same substance as bone-dust, but elaborated by the birds into a pulpy consistence, which, while it continues insoluble in water, has been thereby rendered more readily absorbable by the roots of plants, and digestible (so to speak) in their organs.

"I have, therefore, no doubt, that by the judicious application of these genuine guanos, mixed with twice or thrice their weight of a marly or calcareous soil, to convert their phosphate of ammonia into phosphate of lime and carbonate of ammonia, as also to dilute all their ammoniacal compounds, such crops will be produced even upon sterile lands as the farmer has never raised upon the most improved soil by the best ordinary manure. To the West Indian planter, guano will prove the greatest boon, since it condenses in a portable and inoffensive shape, the means of restoring fertility to his exhausted cane fields—as it has long enriched the poorest districts of Peru."

DR. URE'S ANALYSIS OF MESSRS. W. J. MYERS & CO'S PERUVIAN AND BOLIVIAN GUANOS.

	Parts.
1. Azotized animal matter, including urate of ammonia, together capable of affording from 8 to 16 per cent of ammonia by slow decomposition in the soil	50 0
2. Water	11 0
3. Phosphate of lime	25 0
4. Phosphate of ammonia, oxalate of ammonia, ammonia phosphate of magnesia, together containing from 5 to 9 parts of ammonia	13 0
5. Silicious sand	1 0
	100 0

"Very moist guano has in general more actual and less potential ammonia than the dry guano. The lumps are merely the richest saline parts of the guano concreted by pressure."

AFRICAN GUANO.

The importation of African guano is so recent, that there has not yet been time enough to prove its efficacy by experiments on the land. The four following analyses, however, by Dr. Ure, Mr. Huson of Liverpool, and Professor Herepath, are of high character, and lead us to expect the most sanguine results from its application; and as we know that many hundred tons have already been sold and distributed throughout the kingdom, we look with some impatience and not a little interest for the returns.

Messrs. Lowe, Prichard & Co., of Liverpool, have favoured us with the following

REPORT OF AN ANALYSIS OF A CARGO OF GUANO FROM AFRICA, IMPORTED BY THEMSELVES,

By ANDREW URE, M.D., F.R.S., Professor of Chemistry, &c.

"This is the first sample of clean guano from Africa which I have seen. It has been very carefully collected, and contains no heterogeneous impurities. Its specific gravity is only 1.57 to water 1.00. Impure and decayed guano is always much denser, being sometimes so high as 1.80 or 1.90. 100 parts of this African guano contain 10 parts of ready-formed ammonia, equivalent to about 32 parts of sal ammoniac, and to nearly 40 of sulphate of ammonia. 100 parts contain 21½ of moisture, separable by the heat of boiling water; 100 parts lose 50 parts of volatile saline and organic matter, including the 10 parts of ammonia, by a red heat, besides the 21½ of water, and leave 28½ of white matter, which is chiefly phosphate of lime, with a little phosphate of magnesia and some sulphate and muriate of potash, with a little phosphate of the same alkali. 100 parts contain only one of siliceous sand, showing the guano to be the genuine excrement of the birds. The whole constituents may be thus stated:—

	Parts
"Saline and organic matter, containing 10 parts of pure ammonia	50·0
Water	21·5
Phosphate of lime and magnesia, as also potash	26·0
Silica	1·0
Sulphate and muriate of potash	1·5
	100·0

" (Signed) "Andrew Ure.

"London, 12th March, 1844.

" (copy).

"I have devoted the whole day to a careful analysis of the sample of guano you sent me, and I hope you will be gratified with the result as well as the speedy report.

"I remain, dear Sir,
"Yours, very truly,
" (Signed) "Andrew Ure.

"P.S.—A superficial or imperfect analysis of such a guano as the above would have been injurious to the interest of the importer and merchant. *The quantity of ammonia is remarkably great.*"

ANALYSES OF TWO SAMPLES OF AFRICAN GUANO, BY MR. MUSON, OF LIVERPOOL.

	Parts
Moisture (water)	13·5
Free ammonia	9·5
Azotized animal matter, with ammoniacal salts, chiefly urate and phosphate of ammonia	52·0
Carbonate of lime	6·0
Phosphates of lime and magnesia, traces of oxide of iron, and an inappreciable amount of silica	19·0
	100·0

The analysis of another sample gives:—

	Parts
Water	13·00
Free ammonia	8·50
Azotized animal matter, with ammoniacal salts, as above	47·50
Carbonate of lime	2·50
Phosphates of lime and magnesia	27·25
Muriates and sulphates of potash and soda	1·25
Silica (inappreciable)	—
	100·0

ANALYSIS OF AFRICAN GUANO, BY PROFESSOR HEREPATH.

Mr. Forbes, of No. 2, Great St. Helen's, London, presented to the Royal Agricultural Society of England three specimens of guano, collected on different islands in the Bay of Angra Pequina, on the western coast of Africa. "We have as yet," says Mr. Forbes, "no arrivals of this guano into the port of London, but some cargoes are daily expected, when I shall take the liberty of submitting fresh samples." Mr. Miles stated that the African guano had reached Bristol, and having received from Mr. Greening, of Nelson Street, in that city, the analysis of it, made by Professor Herepath, he had the pleasure of then submitting it to the inspection of the Council:—

"I have analysed Mr. Greening's sample of African guano, and find that it is quite equal to that of Peru of good quality. The results are below, but I have not particularized those matters contained in it which agriculturists do not yet know the value of; all those which are known to be beneficial are—

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	Parts
" Phosphate of lime	21
Soluble phosphates, with a little common salt	8
The elements of ammonia	11
Other matters, almost entirely organic	60
	100

" (Signed)   " William Herapath."

Mr. Lawes observes, that " The analysis of guano is so complicated that it would be useless to give any process for detecting adulterations. It is believed that at present it is not adulterated in this country, but the value of the samples imported vary greatly, some containing no ammonia, while others have as much as fifteen per cent; it is therefore recommended to those that purchase guano, to have the ammonia and phosphate of lime determined by an experienced chemist."

Should the purchaser imagine the guano to be adulterated, let him burn a small portion on a red-hot shovel. If it had been genuine guano, Dr. Ure says the remains will be a white ash of phosphate of lime and magnesia.

DIRECTIONS FOR APPLYING GUANO.

When required for any description of crop to be raised from seed, great care should be taken to have the guano well mixed with the soil, by lightly ploughing, and then harrowing it in, so as to have it regularly distributed *into* the land before sowing, as it is ascertained that seed will not germinate when it comes into *direct* contact with guano. When wood ashes, charcoal, powdered cinders, gypsum, or any other article can be easily procured to mix with the guano, it may be desirable to do so, in order to secure its more equal distribution, but we do not consider this indispensable, so long as the guano is well mixed up with the soil, as described.

When required for top-dressing grain or grass crops, apply it, if practicable, on a damp or wet day, for the sooner rain falls after the application of guano the better. Above all, do not apply it on a windy or boisterous day, or much will be lost.

It is impossible to state the exact quantity requisite for every crop, and upon every variety of soil; but we think the practical farmer will, from the different results and modes of use given, easily find out the necessities of his own lands in this respect, for much, as to quantity, must depend upon the state and condition of his farm, from previous cultivation.

The Peruvians apply guano at three different times to the growing crop —first, when the plant appears; secondly, when in flower; and thirdly, at the formation of its seed. After each application, the land is immediately irrigated, and if the weather should prove dry in this country after the guano is applied, irrigation would be highly advantageous. There is, however, a method of making a solution of guano:—4 lbs. to 12 gallons of water are sufficient. Let it remain 24 hours, and then draw off the solution for use, after that, put 12 gallons more water to the same guano.

Guano should not be mixed with slaked lime, nor put on light land which has been lately limed, because the lime rapidly expels the ammonia from the guano, and, of course, soon impairs its utility. A few weeks should elapse between the applications. Neither should bones and guano be long mixed before they are used, because they act on each other, and their readiest parts are often thus dissipated before they can be applied.

The purchasers of guano should be aware that the volatile part of the ammonia is liable to escape, either by exposure of the guano to air, or by it getting wet. By the addition of about 32 lbs sulphuric acid (oil of vitriol), mixed with twice its weight of water, and thoroughly incorporated with each ton of guano, a *fixed* ammoniacal compound will be formed. By this simple and cheap method the guano may be rendered better for the purposes of manure, and can be kept unimpaired for any length of time.

Having furnished the foregoing particulars, we now give an interesting selection of authentic experiments and results, from a careful perusal of which the farmer may glean sufficient information to enable him to apply his guano to the best advantage. It must, however, be remembered, that the whole of these experiments have been made with the Peruvian and Bolivian guano.

EXPERIMENTS WITH PERUVIAN & BOLIVIAN GUANO.

1.—*By A. Carruthers, Esq., Warmanbie, near Dumfries.*

Had 5 statute acres of Swedes. Applied to each acre 200 lbs. of guano mixed with 1 bushel of powdered charcoal and 4 bushels of ashes of burnt weeds, sown in contact with the seed, by a machine. Drills 27 inches apart. Plants thinned out by hand. Two rows of the turnips, of 376 yards each, after topping and tailing, weighed 357 stones; which gives 19 tons 2 cwt. 3 qrs. 14 lbs. as the produce of each acre. In the same field Mr. C. applied 14 yards of rotten dung and 8 bushels of bones, the latter in contact with the seed. The produce of two rows, 376 yards each, was 362 stones and 4 lbs. of roots, which gives 19 tons 8 cwt 2 qrs. 13 lbs. to the acre.

	Tons.	Cwt	Qrs.	Lbs.
Produce with guano	19	2	3	14
——— manure	19	8	2	13
In favour of manure	0	5	2	27

Cost of manure, at 4s. per yard, independent of spreading, &c., the acre	£2	16	0			
Eight bushels of bones, at 3s.	1	4	0			
				£4	6	0
Cost of guano per acre				2	14	0
In favour of guano				£1	6	0

2.—*By Mr. James Selkirk, Maxwelton House, Dumfries.*

Manured 4 acres of turnip land with guano and bone-dust, at the rate of 2 cwt. of guano and 5 bushels of bone-dust to the acre. Had a fine crop of both Swedish and yellow bullock turnips. Observes that the guano plants stood the dry weather better than the dunged. Tried about half an acre with 1½ cwt. of guano and ashes mixed, and had quite as good a return as from the guano and bone-dust. Thinks guano better than bone-dust, and cheaper by one-third, even according to the prices he paid for the former, and would prefer 3 cwt. of guano to 24 bushels of bones.

3.—*By M. T. Bass, Esq., Burton-on-Trent.*

Tried guano with wheat, turnips, mangel wurzel, and potatoes, at the rate of 2½ cwt. of guano, mixed with ashes, charcoal, or gypsum, to the acre. His wheat did remarkably well, and on a worn-out soil; his turnips and mangel wurzel were excellent; they grew by the side of another crop on farm-yard manure, 20 tons to the acre, that the turnips, if not so large, were more regular, and gave a greater gross bulk than the crop on the farm-yard manure; and the mangel wurzel was so superior on the guano, as to be distinguished from that on the dung 100 yards off. The potatoes did not do so well, owing to peculiar circumstances. The expense of 3 cwt. (instead of 2½) of guano with a proper quantity of gypsum, (which he prefers) ashes, or charcoal, is under £2 per acre, while 20 tons of farm yard manure, including cartage, would be £10 at least. Mr. B. also observes, that a friend, Mr. Gisborne, has tried guano with great success on grass land.

4.—*By Henry Burton, Esq., the Grange, Rock Ferry, Cheshire.*

Land a very strong loamy soil; drawn into ridges for the Scotch drill, and about one-third of an acre manured with 250 lbs. guano, mixed with double the quantity of ashes—the latter half sod and half cinders, which is considerably less than one-third of a ton to the statute acre. The land adjoining was manured with 16 tons of compost, consisting of two-thirds dung and one-third soil. The produce was:—

	Cwt.	Qrs.	Lbs.
From the guano	19	3	3
——— compost	16	0	0
In favour of guano	3	3	25

The turnips are all very good, but 9 acres of white turnips are super-excellent, being from 250 lbs. guano and 10 bushels ½ inch bones, mixed with two-thirds ashes, as above, to the acre.

5.—*By Mr. Lyle, Kirk Enchan Nursery, Isle of Man.*

Four plats of grass on a light and poor soil were measured off. Two plats consisted of Stickney's rye-grass, mixed with small quantities of Holcus lanatus and Poa trivialis, and the other two of Italian rye grass. On the 12th of May one plat of each was top dressed with guano, at the rate of 3 cwt. to the acre, and one plat of each was left undressed. On the 20th June one square yard of the dressed and the undressed spaces was cut and weighed, with these results.—The square yard of Stickney's rye-grass, dressed with guano, weighed 7½ lbs., and the undressed 2¾ lbs. The Italian rye-grass, dressed with guano, weighed 10½ lbs., and the undressed 4¾ lbs.

6.—*By Henry Ford, Esq., Sheaf House, Sheffield.*

The land used was rather more than a rood, a light loam. It was planted with potatoes—the kinds being American natives, Prince Regents, and short-topped reds—the sets, 2 eyes each and 7 inches apart, on ridges 2 feet apart and 15 yards long, manured them alternately with 1 lb. of guano to each row, for 5 rows; 5 more rows with 1 lb. of *nitrate of soda* to each; 5 more with good stable-dung; 5 more with *horn-shavings*, and so on alternately with the respective kinds till the whole was finished, leaving 2 rows of each kind without manure of any kind. The management in hoeing and earthing up was exactly alike with all. Nitrate of soda cost 27s. the cwt.; guano 23 guineas the ton; horn-shavings 12s. the cwt.; stable dung 6s. a ton. The results were as follows:—Every row of short-tops manured with guano yielded, on an average, 1 bushel each; those with stable-dung 3 pecks each; those with horn-shavings and nitrate of soda very little more than 2 pecks; and those with no manure were equal in weight to the last. The native Americans yielded with guano 3 pecks each; those with stable dung 2½ pecks; those with nitrate of soda and horn-shavings 2 pecks each; and those with no manure rather more. The Prince Regents yielded the same quantity as the short-tops, with all the manures.

7.—This experiment is given on the authority of the Editor of the *Carlisle Journal.* 2½ acres were sown with 2 cwt. of guano, mixed with 58 bushels of finely riddled coal-ashes to the acre. 8 acres were sown with farm-yard manure, at the rate of 28 cart-loads to the acre. The field was a moderately good turnip soil, merely ploughed and cleaned after oats. The turnips cleared from dirt, and the roots cut off, gave the following average per acre:—

	Tons	Cwt.	Qrs	Lbs
White globe turnips, with the leaves, &c., from manure	67	14	0	5¼
Ditto, ditto, from guano	64	16	1	20
In favour of manure	2	17	2	13¼
Ditto, without leaves, from manure	56	3	3	20
Ditto ditto from guano	48	19	2	2¾
In favour of manure	7	4	1	17¼
Purple-topped turnips, with leaves, from guano	74	3	2	21
Ditto, ditto, from manure	62	18	2	8
In favour of guano	11	5	0	13
Ditto, without leaves, from guano	47	17	3	18
Ditto, ditto, from manure	45	7	2	0
In favour of guano	2	10	1	18

8.—This is another experiment of the anonymous class. It is taken from the *Hereford Times*, and has all the appearance of authenticity. Two acres of orchard ground—red clay, were manured, one half with nitrate of soda, the other half with guano, each at the rate of 1¼ cwt. to the acre. A strip of a quarter of an acre was left untouched with the manures. Result—on the unmanured part about a ton per acre; on the nitrate a little more than 1½ ton; on the guano considerably more than 2 tons, indeed nearly 2½ tons—of hay, we presume, for it is not stated.

The experiments following are taken from the *British Farmer's (Quarterly) Magazine*, published by *Ridgways*, London, and *Cannell*, Liverpool.

9.—*By W. Turner, Esq., of Haslingden, Lancashire.*

I tried this natural manure on two fields for grass, top-dressed them both with 2 cwt. of guano per acre. The dry weather was against it; but a full crop on one field was the result. The other field I irrigated well by a water-cart. I had four-fold my crop of grass, and now (12th December, 1842,) the grass is so thick that my cattle will not be able to eat it all off, it grows so fast, being a mild open season.

10.—*By Mr. Haselwood, Withy Brook, near Coventry.*

I have tried guano on turnips, and have a heavy crop. Many of the turnips weigh 21 lbs., and measure 35 inches in circumference. I like guano so well that I shall use more next season. It far surpasses any manure I ever met with.

11.—*By Mr. Robert Bell, Gunsbro', Listowel, County Kerry.*

I first witnessed the effects of guano as a powerful fertilizer in the growth of early potatoes, by applying a little round the shoot, soon after its first appearance above ground, a greater luxuriance of growth was perceptible in the stalks a few days after, and having added a little more previous to earthing them up in the usual way, was afterwards astonished to find potatoes quite fit for the table at the stalks manured with guano, while those not so treated were scarcely formed; although of the same description of seed, and planted at the same time. Again, I applied it to potatoes fit to dig, the tops of which had lost their green appearance, and were of the hue indicating maturity of the root, and a few days only elapsed before they were changed to the green and growing state they were in some weeks previous, and it was found eventually on taking up the crop that not only were the potatoes larger, but that a second growth of tubers of small sizes and very numerous had been the consequence of the application of the guano. These potatoes were manured at the time of planting with farm yard dung.

I tried guano also by itself, at the rate of 2½ cwt. per acre, in drills, at one side of which were potatoes manured with rich compost of earth and dung, and at the other with nitrate of soda in the same quantity. The crop on the whole was an extraordinarily heavy one, accounted the most abundant ever seen in this part of the country: but during the summer and autumn the haulms of the potatoes planted with guano and nitrate of soda had a much darker green and more luxuriant appearance than the other; and heavy as the crop was generally over the field, I consider the guano drills the best, the nitrate of soda the next, the tubers being larger, several of them weighing upwards of 3 lbs., and not a small one to be seen. The land was made very fine at the time of planting, and every weed eradicated, and twice horse and hand hoed, previous to earthing up. Immediately on the crop being lifted the field was sown with wheat, which at this time looks beautiful, alike on the part manured with guano and nitrate of soda as on the other.

My next trial with guano was with turnips. I tried it sown broadcast on the land, afterwards drilled up lightly before the seed was sown, alongside of deep drills, with farm-yard manure applied at the rate of about 20 tons per acre, on a fine loamy soil, the braird of those with guano was not only stronger and more regular, but the tops of the turnips have continued in their fresh and green state, after a great part of the others had fallen to decay, and the crop was much more even and better than the other part of the field. In speaking of this crop, perhaps it were well to mention that I had sown a few drills without any manure, at one side of those manured with guano, merely to see the difference. The seed certainly did braird, but that was all, for they scarcely made any progress whatever, and were considered as not worth the labour of hoeing: but I desired the work-girls to pulverize a quantity of guano, and put a little round each sickly plant; and when I visited the field some days after I was literally astonished to see the change that had taken place—the leaves of the turnips had grown and spread so rapidly as nearly to meet in the drill, and have turned out, much to the surprise of every one acquainted with the facts of the case, a very fine crop.

The only other instance I have tried guano in the fields is on wheat, and in this case it was mixed with mould and ploughed in previous to sowing; the wheat came up well, and has a beautiful colour, with that peculiar curl which denotes a promising crop.

I planted several apple trees, and put about a pint of guano to the roots of each at the time, they are growing remarkably well, and although we did not allow them to bear last season, excepting two trees only, in consequence of being so young, it is a singular fact, they have *all* blossomed *twice* this year, and the two we allowed to bear, while the ripe apples were upon them were in blossom at the same time. The raspberry bushes manured with it also came in blossom after bearing fruit.

From the experience I have had with guano, I consider it peculiarly adapted for the potato crop (to which it should be applied at two different times) as well as to the turnip and cabbage and green crops in general. I think it very applicable to mountainous districts, where cartage is impracticable; for a man could carry as much on his back as would manure his half-acre of ground. The Knight of Kerry, Valentia; Pierce Mahony, Esq., Kilmeary, Charles Chambers, Esq., Blennerville, and several others in this quarter who have tried it last season, have all expressed to me their high opinion of its merits.—December 20, 1842.

12.—*By Mr. John Pritchard, of Kirkdale, near Liverpool.*

In one of my fields I made an experiment with guano this year. The test was very unfavourable for it, as the field was in a very bad state of cultivation. In consequence of the land never having been drained, it was very wet. From this cause the crop of turnips failed entirely on it in 1841 (being a very wet season). The field is near the wall of the Kirkdale Gaol, and has a cold clay bottom; I ploughed it 17th February, as, from its wet state, it could not be done before, though the field slopes to the south. I sowed it the 18th of February, with white wheat; it was well manured for turnips in 1841, in drills, trench ploughed, and well manured with horse and cow dung. The wheat came up tolerably in March, but in April it became very yellow, sickly, and evidently failing fast. A deal of the plants died, so that I thought of ploughing it up for barley in May, when I accidentally heard, through my friend Mr. Danson, of Liverpool, of guano. I tried a bag of 1¼ cwt., costing £1 1s., mixed it well with an equal quantity of riddled old worn out soil, and threw it broad-cast on the field on the 6th of May, but did not harrow it in. Rain came on the same evening, and in ten to fourteen days the wheat had a splendid appearance, quite a healthy green, continuing very visibly to gather root daily; and when it came to ear they were well fed, very long, and the straw remarkably strong. I reaped the crop early in September, and had 25 to 30 bushels to the statute acre of most excellent white wheat, which I sold to my friends at 8s 6d. per bushel of 70 lbs I consider it an excellent crop for a bad field, which had never been drained. If I had applied guano well mixed with sand, ashes, or charcoal, two months before, I have no doubt I should have had 40 bushels per acre —December, 1842.

13.—*On Turnips, by X. Y.*

A field of 3 statute acres was manured with guano, 4 cwt. per acre, in the spring of 1842 It had a potato crop in 1841, and turnips drilled, 1842. The plants came up slowly at first, but after rain the tops were quite a different and more healthy green than others not manured with guano. The crop was exceedingly large. To prove the weight, twenty cart-loads were got, and weighed by the machine at the Liverpool market. The grower is satisfied the crop is 50 tons per statute acre You are authorized to refer any party to me who wishes further information —December, 1842.

14.—*By W. J. Heacock, Esq., Fonlow Grange, Derbyshire.*

I am happy to give my testimony in favour of guano, as a most valuable manure for turnips. I applied 2 cwt. to the statute acre; the soil is a light loam of indifferent quality, seated upon limestone, and rendered poorer by massive ploughing, at an elevation of eleven hundred feet above the sea I drilled the guano in with the seed, without the admixture of charcoal or any other substance. I dressed an acre, in the same field, with 3 qrs. of bone dust. For a time after the plants appeared, there was no perceptible difference, but immediately after the first rain, those upon the guano began to outstrip in growth those upon the bones, they continued to do so, and I should say that the turnips are now nearly twice the size. I cannot give the comparative weights of the produce, as they are not at present got up; but perhaps you may form some idea of the great superiority in appearance of the plants upon guano, when I tell you that a friend of mine remarked that they were like trees in comparison with shrubs I think I need hardly say more in favour of this excellent manure, than that I am so well satisfied with the result of my experiment, that is my intention to use it again, and that several of my neighbours who have witnessed the effect of it upon my field, intend to give it a trial. I dressed about a rood of grass land at the same rate per acre, but it was *so very poor* that I hardly expected to see much effect, and I will not undertake to say that it rendered the grass more succulent, or that I had a much greater produce upon it than

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upon the other parts of the field, which were dressed partly with farm-yard manure, partly with soot, and partly with the dung of fowls; but I observed when the cattle were turned into the after-grass, that they were very partial to that part of the field where the guano had been sown, which I consider a good proof that there was an improvement in the herbage.

15.—*By R. Townley Parker, Esq., Cuerden Hall, Preston.*

On the 28th April, 1842, 7 acres 3 roods 23 perches, statute measure, of pasture land, in poor condition, of strong clayey nature, were covered broad-cast, at the rate of 3 cwt. of guano and 1½ bushels of powdered charcoal per acre. After the first shower of rain there was a striking improvement in the colour of the vegetation, and the cattle evidently, after a few days, preferred that part to any other in the pasture. At the same time 6½ acres statute measure, of meadow land were covered broad cast, at the rate of 2½ cwt. of guano and 1¼ bushels of charcoal dust per acre. The improvement was so immediate, and the promise of beneficial effects so great, that I determined to carry out the experiments still further, accordingly, on the 20th May, 18 statute acres were covered in like manner, and with the same proportions of guano and charcoal dust. The nature of the soil in all this meadowing is very stiff upland, but well drained. It had never, to my knowledge, been satisfactorily productive. The whole of this meadowing was cut in June; the result was abundant, and exceedingly thick at the bottom. On 5 statute acres of the same meadow, (but where the quality of the soil is very much better, and always has produced a much heavier crop) 30 loads of farm-yard manure per acre had been laid on in the spring. The produce this year was about one-third in favour of those parts to which the guano had been applied.

16.—*By Mr. William Buchanan, of Newry.*

My mode of mixing the guano is as follows:—To each cwt. of guano add four cart loads of dry earth, well riddled, which may be taken from either head or foot ridge of a field. Then to form a bed (in a dry place under cover) with a layer of the riddled earth about a foot deep, then a layer of guano about an inch deep; so on, layer and layer about, until all is finished. Let it lie so as to ferment for 6 or 8 hours, then turn it fairly over, letting it lie to 8 or 10 hours more, then riddle all together, when the lumps of guano, if any, will be easily broke with the back of the spade or shovel. By this mode the whole will be converted into one mass of manure, when it may be sown broad-cast over

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grass land, wheat, barley, or oats. Choose a wet day for sowing on grass lands, but a dry day for sowing on wheat, barley, or oats; giving a very slight harrowing at the time of sowing, and at the rate of 3 cwt. of guano so mixed to the Irish acre, for wheat, barley, oats, and grass land, with 4 cwt per acre for turnips and potatoes. This is the quantity I myself tried on all the above crops, and found it to succeed beyond my expectations, particularly my turnips over my potatoes; for it gave me 40 tons of turnips, without tops or roots, to the Irish acre, and that after a crop of rape. If any one should be sceptical as to the results, my crops are here to be seen.—January 21, 1843.

17.—*The Wire worm, Slugs, &c., killed by Guano.*

Sir,—I understand you take a great interest in disseminating useful information amongst farmers, and as the new manure, guano, is now getting into general use both in Ireland and England, I beg to state that I sold last year a considerable quantity for trials, in various quarters of the counties of Down, Armagh, Louth, Monaghan, Cavan, Kilkenny, Roscommon, &c. The results are generally highly favourable. Mr. Wm. Blacker, of Market Hill, used it to a great extent last year, and this season he is covering upwards of 1000 acres, which will take about 100 tons of guano; and at turnip time, from May to July, *ten times* the quantity will be required, as it preserves the crops, besides bringing them to maturity much earlier. There is a fact connected with potatoes this winter which should be generally known, viz., the binns of potatoes in the field grown with guano manure were preserved through the winter; but those potatoes grown with farm-yard manure partially decayed in the binns, but when brought into the barn kept well, the crops from guano were superior to the others, had a finer skin, and much better in quality. The soil was sandy, and lies near the sea-shore. Several who used guano for potatoes and turnips last year, sowed wheat in the autumn and this open spring, which looks remarkably well, without further manuring. If necessary, in May, a slight top-dressing with weak guano in solution, one pound of guano to eight gallons of water, may be given.

Guano, from its having the properties of nitrate of soda and other acids and salts, kills slugs, wire-worms, &c., in the ground, and acts as a preserver and protector of the growing crops in a variety of ways beneficially.

I am, Sir, your obedient servant,

Blain Leyland.

Newry, 20th March, 1843

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18.—*From the Proceedings of the Liverpool Agricultural Society.*

R. Neilson, Esq., said he was induced to try guano for wheat. He had a piece of land of ten statute acres, which he worked up with guano. Out of the ten acres seven were entirely destroyed by the strength of the manure, and the other three were preserved by not putting so much of the manure on. These had produced a very fine crop, some of which had been shown that day (29th Sept.) and that from a wheat that was not large in the head. He tried the guano with mangel wurzel, and found that four or five cwt. were as good as twenty tons of the farm-yard manure. It was decidedly an advantageous manure for cheapness, if it were properly introduced into the soil. It ought to be harrowed in. With turnips it had the same effect. Wherever the seed was in contact with the guano, or put into the drill where the guano was sprinkled on it, the seed was destroyed. The heat of the manure was so powerful, that it ought to be harrowed into the land, and remain some short time for the soil to absorb its virtues before the seed went in. He had made a mixture of charcoal, guano, and farm-yard manure, and he found that answered the best. He believed guano was a decidedly valuable introduction into this country, and of great benefit to the farmer, even if he was obliged to repeat it yearly. The expense was slight, and the convenience of putting it in was obvious. It had only to be more generally tried to be more generally used.

From Mr. John Taylor, Surgeon, Liverpool, to Mr. W. Dawson.

SIR,—Having noticed the progress of guano, from its numerous analytical examinations through all its phases of practical application to agriculture, it has afforded me considerable satisfaction to perceive how well its theoretical character has been sustained by the *results* of experience. In the comparative trials which it has undergone with farm-yard manure, ammoniacal salts, nitrate of soda, &c., it has proved a concentrated animal manure of the richest fertilizing properties, capable of producing larger crops at less cost, than any other, taking into account its slow solubility in the soil, which gives it permanence beyond its rivals. The discovery of the best means of applying it, so as to render the greatest amount of service, has obviated any objection against its use, and manifested its superiority when appropriately combined with sulphate salts, or decayed vegetable and carbonaceous matters, with due reference to the description of produce expected. The latest analysis of the genuine guano by Dr. Ure, shows an entire absence of sand and other impurities which have been discovered in a large proportion in other specimens, and describes it as a compact mass of the salts of ammonia in combination with soluble phosphates, than which nothing can be conceived more nutritious for the support of vegetation. The genuine guano, therefore, when mixed with an appropriate compost, excels farm-yard manure by the less amount of labour expended in its use; it excels bones, by possessing their nutritive phosphates in conjunction with much salts of ammonia; it excels the various refuse compounds of ammoniacal salts by possessing the phosphoric salts in addition to abundance of ammonia; and the possession of these salts likewise gives it a preference over nitrate of soda, which, like the ammoniacal salts, merely stimulates the growth of plants at the expense of the phosphates contained in the soil.

I am, Sir, your most obedient Servant,

JOHN TAYLOR.

[illegible] Street, Liverpool,
January [illegible] 1843.

[illegible]—*From Mr. Skirving, Walton Nursery, Liverpool.*

GENTLEMEN,—I am happy to hear that this new manure, which was tried in our neighbourhood last year for the first time, with such favourable results, has again proved itself to be one of the most valuable manures [illegible]. It has been used to a considerable extent in this county, both in a dry and liquid state; and in every instance, when properly applied, has answered well for crops of every kind. It has likewise been proved to be a lasting manure, for very good crops have been obtained without any manure whatever, from land where guano was applied, and yielded good crops last year. I have applied guano on wheat and other grain crops, and on grass lands as a top-dressing, at the rate of 2 cwt. per statute acre, with most excellent effect. For turnips, I have used 4 cwt. to the acre, and had very good crops; and from 4 to 6 cwt. to potatoes, with like success. In the gardens and nursery grounds I have used it in a liquid state, and in that manner has surpassed every manure yet discovered. Its effects on young fruit and forest trees are wonderful; also upon hot-house and green-house plants of every description; even the exotic heaths, to which manure of every kind has been considered injurious, seem to flourish in a manner beyond precedent when watered with it.

20.—*From a Prize Essay of the Wetherby Agricultural Association.*

"For all purposes for which bones or farm yard manure are applied, guano must be successful. Many experiments have proved this. Gen. Beatson found—

"35 bushels of guano per acre	to	yield	639	bushels	potatoes
35 loads of hog's dung	,,	,,	534	,,	,,
35 ,, horse dung	,,	,,	626	,,	,,
Soil simple	,,	,,	448	,,	,,

"200 lbs. of guano per acre, applied by Mr. Smith, of Gunton Park, gave 50 bushels and $\frac{1}{2}$ a peck of wheat per acre, while 15 bushels of bone-dust gave 36 bushels per acre. Mr. Lowe, of Shoreham, Kent, applied 2 cwt. per acre for turnips with success. Mr. Skirving, of Liverpool, used it upon Swedish turnips and Italian rye-grass, 2 to 3 cwt. per acre he found equal to 20 cubic yards of farm-yard manure. Our own experiments with it have been on Swedish and white turnips. For Swedish turnips it was applied at the rate of 2 cwt. per acre, with an equal quantity of earth For white turnips, 2 cwt. per acre was used, mixed with 6 bushels of earth; and 1 cwt per acre, mixed with 12 bushels of bones, upon another portion. The manure was drilled with the seed, and the consequence was, that a large portion of the seed was destroyed. In places where the seed had not mixed with the guano, the turnips came up well, and had a more luxuriant appearance than those manured with other substances."

This essay was written before the author could know what his crop would be; but he says—

"They (the guanoed turnips) have made such progress, that although half the ground is without plants, if the bulb corresponds with the tops, we much question whether the crop will not equal other portions in the same field where there is no deficiency of plants. The colour of the plants is at this time darker than those manured with other matters."

With regard to the destruction of the seed, the author of the essay observes—

"We believe, that had the tubes which take the seed separately and drop it, upon the seam after the earth has slightly mingled with the manure, been affixed to the drill, the germination of the seed would not have been prevented." The author then advises, "that in no case for turnips should less than a ton of earth or ashes be mixed with each cwt. of guano. Upon grain," he continues, "it may be safely applied with less than half this mixture of earth; 1 or $1\frac{1}{2}$ cwt. with 20 bushels of earth or ashes will be a fair application; and he thinks a little powdered charcoal mixed with it, would add to the permanency of guano."

21.—At the annual meeting of the Lancaster Agricultural Society, October 10, 1843, the secretary, Mr. Binns, said—"I may mention an instance of increased produce which was stated to me by Mr. Skirving of Liverpool, where poor land that grew little grass, supporting only about a dozen cows, was broken up, well cleared, manured with guano, and sown with Italian rye-grass, after which it produced several cuttings of grass in eleven months after sowing, and supported *fifty* cows. The various cuttings measured together thirteen feet in length, when ordinary grass land will not produce more than three or four feet."

The following results are from An Essay on Artificial and other Manures, by Mr. W. F. Karkeek, Secretary to the Cornwall Agricultural Association:—

22.—In 1839 Messrs. S. & R. Davey of Redruth, enclosed a portion of St. Agnes's Common. After the land was broken up it was dressed with bone dust three quarters to the acre, and sown with wheat, which failed. Oat crop the following year, manured with one cwt. nitrate of soda, produce 36 bushels of oats and no seeds. The field was then tilled to barley in 1842, and dressed with scavengers' dung at £9 an acre; produce only 18 imperial bushels per acre. In 1843 the seeds made little progress, and it was dressed with 2 cwt. of guano an acre. The growth shortly after this was surprising, and the grass was so abundant during the season, that it was a wonder to the neighbourhood how so much stock could have been kept for such a length of time.

23.—Another portion was broken in 1840. Wheat sown in November, dressed with bone-dust three quarters to the acre, failure. Oats in 1842, dressed with 2 cwt. of guano and 10 loads compost dung, earth, &c.: produce per acre from guano, 77 bushels white oats; produce from dung and compost 29 bushels black oats. In 1843, seeds, dressed with 2 cwt. of guano, which presented a very superior appearance when the essay was published.

24.—Four acres twenty-five perches of similar land were broken in 1842, sown with Swedes in July, manured with 4 quarters bone-dust and 1 cwt. guano per acre; produce 20 tons per acre. Sown with barley in 1843, manured with 10 cwt. of hoofs of animals, at a cost of £10 per ton, and 1 cwt. of guano per acre; produce 12 imperial bushels only. The powerful effects produced on the oats and rye-grass were most extraordinary; the latter growing to such a degree that it completely choked the clover, and very nearly the barley. The field has now the appearance of an old coarse pasture.

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25.—Four quarters bone-dust and 1 cwt. guano were applied to another portion of the waste, turnips and Swedes were sown late, and the produce was 18 tons per acre. Oats the following year, 2 cwt of guano per acre produce 60 bushels per acre, and present appearance very superior.

26.—On the Earl of Falmouth's land some experiments were tried by Mr. Rope. A piece of pasture was selected which had not been broken up, but alternately mown and grazed for 50 years; three half acres were measured, and manured with dung, bone, and guano, on the 24th of March, the hay was cut on the 10th of July and weighed on the 15th, and the following are the results:—

Manures.	Cost	Weight of Hay	Value at 30s. per Ton	Profit.	Loss.
	£ s d.	T c q lb	£ s. d.	£ s d	£ s d.
15 loads Plymouth dung	4 8 0	1 8 0 0	2 2 0		2 6 0
10 bushels bone dust	1 12 0	1 2 2 0	1 13 9		0 1 9
134 lbs. guano	0 17 0	1 12 3 0	2 9 0	1 12 0	

The after grass was very good on all the pieces, but the cattle preferred that which had been manured with bones.

27.—It has been stated that guano is injurious to clover and young grasses; but from experiments made by Mr. Rope, such notion appears unfounded. He sowed double the former quantity per acre, and the like quantity on some young clover, and the rapid growth of each was extraordinary. The spots where the guano was applied could be distinguished at a great distance.

28.—Mr. Rope also tried an experiment on a field of five acres of Swedish turnips. 1st, dung, sand, &c., at £4 2s. per acre, produce 7 tons per acre; loss £1 6s. per acre. 2nd, dung, sand, &c., and 2½ cwt. guano, £5 16s., produce 22 tons, gain £3. 3rd, dung, sand, &c., and 2½ qrs. bones, £7 2s. 6d., produce 25 tons, gain £2 17s. 6d. The turnips were estimated at 8s. per ton.

29.—In a trial between bones and guano by Mr. C. Parks, of Michell, the advantage was also in favour of guano. 3 quarters bone, at £3 12s., produced 15 tons 4 cwt. 1 quarter 4 lbs. turnips, which, at 8s. per ton, gives £6 1s. 6d. 2¼ cwt. guano, cost £1 10s., produced 21 tons 15 cwt. 2 quarters 24 lbs., which, at the same price, gives £8 14s. 3d.,

From guano	£8	14	3
From bones	6	1	6
In favour of guano	£2	12	9

30.—The following experiments are from the first annual report of the Derwent and Shotley Bridge Agricultural Society. They were made last year by Mr. Joseph Bell, on his farm at High Waskerly.

	£	s.	d.	Lbs. Turnips
20 loads fold-yard manure, mixed with soil, at 4/6	4	10	0	[illegible]
16 bushels bones, at 2/3, mixed with 5 loads ashes, sawn by drill, at 1/	1	18	0	310
25 bushels dust and ½-inch bone, sawn by hand, at 2/3	2	16	3	250
52 gallons coal tar at 1d., with 8 fothers soil at 1/6, and 8 fothers ashes at 1/	5	17	10	270
3 cwt. guano at 17/, mixed with 3 fothers ashes at 1/	2	14	0	370

31.—Mr. John Dudgeon, of Spylaw, Kelso, furnished a report of Comparative Trials with Guano as a Manure for Turnips to the Journal of the Highland and Agricultural Society of Scotland. We have only room for the results; the particulars can be seen in the above named publication.

After topping and tailing, the turnips weighed,—from

	Cwt.	Stones.
Guano, 5 cwt	23	6
Dung, 18 yards	18	7
Guano, 4 cwt	22	6
Dung, 18 yards	18	7
Guano, 3 cwt	20	6
Dung, 18 yards	18	2

32.—In a trial with guano and bone-dust—

	Cwt.	Stones.
Guano produced	23	2
Bone-dust and coal ashes	19	2

Guano at the rate of 3 cwt per acre, bones 16 bushels and coal ashes 8 bushels.

33.—In a third experiment guano was tried against bone-dust alone, guano at the rate of 2 cwt per acre, and bone-dust at 16 bushels per acre. The result was—

	Cwt.	Stones.
Two drills guano	31	[illegible]
Two drills bone-dust	24	7

34.—At a monthly meeting of the Swansea Farmers' Club, during a conversation on manures, Mr. Frankland stated that he had made experiments with guano in a liquid state. He applied some to a stick of rhubarb, which, when gathered, weighed 29½ ounces, whilst those sticks grown without guano averaged but 13 ounces each.

35.—Mr. Berrington said that some grass to which he had applied guano was about six inches longer than that on which no guano was used, and the difference in verdure, &c., was so striking, that it was obvious half a mile off.

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The following are from the Quarterly Journal of Agriculture. The experiments were made by Robert Monteith, Esq., of Carstairs.

36.—OAT CROP. 1843.

	£	s.	d.
Cost of guano 31/.—Produce, 59 bushels, at 2/6	£7	7	6
Cost of bones 33/4—Produce, 43 bushels, at 2/6	5	7	6
	2	0	0
Deduct difference of manure	0	7	8
In favour of guano	£1	12	4

37.—HAY CROP, 1843.

To part of a field, manured the previous year with farm-yard dung, was given 267 lbs. guano per imperial acre, at a cost of 31s.; and the *extra* produce per acre was 22 cwt. of hay, which,

	£	s.	d.
At 3/ per cwt. is	£3	6	0
Deduct expense of guano	1	11	0
Leaving per acre in favour of guano	1	15	0

38.—TURNIP CROP, 1843.

	Cost £	s.	d.	Produce Tons.	Cwt.
Guano, 4 cwt.	2	8	0	11	8
Dung, 28 yards, sulphate of soda, 1 cwt.	8	16	0	9	8
——— burned bones, 6 cwt.	7	14	0	7	11
——— bone dust, 28 bushels	7	18	6	7	2
———	5	12	0	4	19
——— gypsum, 2½ cwt.	6	8	6	6	1
——— guano, 4 cwt.	8	0	0	7	13

39.—*Results of an experiment at Chardstock, near Chard.*

POTATOES.—The application of guano as a dressing for potatoes has been attended with surprising results. In a piece of hilly ground where the soil is poor and strong but clean, were planted 2 rows of potatoes, each occupying 2½ perches. Guano at the rate of ½ cwt. per acre, mixed with a moderate proportion of coal ashes was hand-sowed over the first of these rows, while none was applied to the second row. During the growth of the potatoes a manifest difference was observable in the luxuriance of the stalks in the 2 rows, and on taking up the crop the result was as follows:—

	Lbs.
First row manured with guano produced	430
Second row without guano	230
Extra produce from guano	200

40.—Mr. Moseley, of Glenham House, Saxmundham, Suffolk, communicated to the Council of the Royal Agricultural Society of England the results of his comparative experiments with manures. The whole produce of grass was weighed in his presence, the day after it was mown and strown, therefore the weight must be deemed that of *grass*, not of hay.

				Tons	Cwt
134 lbs guano	cost 16/7½	per acre, produced		4	12
134 lbs. nitrate of soda	,, 28/	,,	,,	4	12
58½ lbs. sulphate of ammonia	,, 15/8	,,	,,	4	10
21½ lbs. carbonate of ammonia	,, 18/	,,	,,	3	18
42 lbs Saltpetre	,, 16/6	,,	,,	3	3

41 —*Experiments with different Manures on the Potato Crop, by Mr. W. Smyth, Mitchelstown, Kells,* 1843.

From the "Gardeners' Chronicle"

The following experiments on the application of various manures to the potato crop were tried last season, and as the mode of culture adopted differs from the usual practice, a few words of explanation on that subject are necessary. The land is of very superior quality, consisting of a moderately tenacious clay, through which a considerable portion of an impure carbonate of lime is interspersed, part of which is incorporated with the soil, and part occurs in the form of small stones, which, however, are rarely of such a size as to form any obstacle to the operations of tillage It had been previously many years in grass, and being merely marked out into ridges by the common plough, the potatoes were planted on the surface without any manure. This practice is well known throughout a great part of Ireland; it is also usual to let the land in this state to produce a crop of potatoes to the neighbouring cottagers, and from £4 to £6 per acre are frequently obtained for this purpose. This is the con-acre system, which has at different periods attracted public attention, as one of the causes for much of the pauperism in this country; but to this subject it is not necessary to make any further allusion in this place. The potatoes were planted on the 15th of April, and were of the variety called cups, which I believe are generally known*. The ridges were five feet wide, five sets being placed across the ridges, being thus nearly a foot distant across, and nearly eighteen inches distant in the other direction. These were covered about three inches deep with the earth out of the furrows. Before the young shoots had reached the surface through their covering the various manures were spread on the surface in the proportions stated below. An additional covering of earth, two inches deep, was then put over the ridges The application of the manures and the covering of earth took place the same day, on the 20th of May. On the 15th of June the spaces between the rows across the ridges were loosened by the hoe, and drawn up to the stems of the plants, forming, in fact, drills as it were across the ridges. The potatoes were taken up on the 10th of October, and the following table exhibits the results :—

Kind of Manure	Quantity applied per acre	Produce per acre		Cost of application		
		Tons.	Cwt.	£	s.	d.
1. Guano	3 cwt.	19	11	2	2	0
2 Bone dust	16 bushels.	15	13	2	8	0
3 Nitrate of soda	2 cwt	16	19	1	10	6
4. Nitrate of potash	2 cwt	15	6	3	14	0
5. Muriate of ammonia	2 cwt.	17	15	2	15	0
6 Salt and quicklime in equal quantities	8 cwt	14	17		12	0
7. Farm-yard manure	10 tons.	16	3			
8. No manure applied		13	18			

The farm-yard manure was that of the preceding season which had remained over in the yard, and was therefore well decomposed. Each of the other manures was mixed with a small portion of dried earth a few days before being applied. The common salt was obtained from a provision store, and contained a considerable portion of animal matter, as blood and pieces of fat, though its effects in combination with the lime were not very great. The whole of the manures applied were successful in so far as having considerably overpaid the original outlay. Another circumstance I may here mention as worthy of observation.—The produce of two equal portions of the crop, to which no manure had been applied, the earth in the one case having been hoed between the plants and drawn up to their stems, and the other not, showed clearly the advantage of the former treatment, the difference in produce being no less than one ton and three quarters per acre. This work was performed by boys and girls, under the superintendence of an experienced labourer, and the entire outlay did not exceed 7s. 6d. per acre. The statute acre is referred to in the preceding remarks, although here all calculations are made in plantation measure of 49 square yards to the perch.

42.—*Experiments with Swedes, by Mr. Templeton, at Ballyhidy.*

Sown May 19. 1843, after oats, soil an adhesive clay, furrow-drained and subsoil-ploughed 15 inches deep, and limed, 50 barrels an acre, before the crops were put down. 4 cwt. of coal-ashes were added to each cwt. of guano,

	Cost				*Per Scotch acre*			
Bones, 30 bushels ..	£3	0	0	produced	26	Tons	3	cwt.
Guano, 2 cwt., bones 15 bushels..	2	10	0	,,	34	,,	2	,,
Guano, 4 cwt ..	2	0	0	,,	30	,,	18	,,
Farm-yard manure, 40 tons ..	8	0	0	,,	33	,,	15	,,

The following Results of Experiments made with Guano on the Experimental Farm of St Pierre d Irube, near Bayonne, are from a Report to the French Minister of Agriculture.—

On Natural Meadow Land, Irrigable.—Applied the guano at the rate of 1600 lbs. to the acre. Result (where there had never before been but two crops), three crops of hay and after-grass, and, each at least twice the quantity of the crops from equal spaces in the same meadow not treated with guano.

On the same land four equal and contiguous spaces were manured—one with wood-ashes; another with well-rotted dung; another with an old compost of soil and lime; and the fourth with fowl-dung; and this latter at double the rate at which guano would have been applied. The result was, two crops only, and inferior by one-third to one-half to the crops from guano.

At the rate of 800 lbs. of guano to the acre two crops of hay were got, one-third greater than from dung and the other fertilizers named; and at the rate of 500 lbs. to the acre, the first crop was more abundant than the crops from the dung, &c.; but the second crop had no superiority.

With regard to quality of crops, the hay from the guano was the finest; and the cattle eat it with eagerness.

On Potatoes.—Applied the guano at the rate of 200 lbs. the acre. Drills 22 inches, and the sets 13 to 15 inches apart. Applied the guano all round each set, in quantity as much as could be taken up with three fingers and the thumb. Produce good and sound.

On another part of the land, planted with a compost of earth and dung, and another part with dung only. Produce from each inferior to that from guano; but the produce from the compost was nearest.

On Vetches and Oats for Fodder.—Used the guano at the rate of 240 lbs. to the acre. The vetches and oats were sown first broad cast; and the guano in the same way afterwards. The ground was then harrowed. Vegetated quick and vigorously. On another piece, with dung, one-half more than usual, for the piece had been previously manured for another kind of crop, the vegetation was beautiful, but not so quick as with guano.

On Winter Wheat.—Sowed the guano in April, on a part of the field where the plants were poor and yellow, and when the ear was beginning to shoot, at the rate of 200 lbs. the acre... In 14 days the colour was as good as, and the height of the plants equal to, the plants on the healthy part of the field. On harvesting, the guanoed wheat was found finer both in straw and grain than the other wheat. A portion of the unhealthy wheat was left untouched with the guano, and it remained poor. On a piece where the wheat was already fine, an application of guano made it half as fine again, both in grain and straw.

On Mangel Wurzel.—Used the guano at the rate of 80 lbs. the acre. Dibbled the seed, and put in each hole as much guano as could be taken up with two fingers and the thumb. Result good, and the same as with good dunging. In some places no plants came up, and the reporter attributes the failure to the accidental application of *too much guano.*

On Clover.—Fifteen days after the first crop was carried, the guano was spread on a piece of land, at the rate of 120 lbs. to the acre. The vegetation was superior to that on the unguanoed part of the field, without excepting a piece that was limed. Produce about one-third more than under the ordinary circumstances.

The author of the report remarks, that one hot day he was in the meadow in which the first experiments were tried, and saw a great dryness prevailed everywhere but on the guanoed part, which was remarkable for its verdure and vigorous vegetation. He was struck with the circumstance, and thrust his hands into the grass, and found that it was as wet as if there had just been a plentiful rain. He also informs us, that, on the same land, part of a sack of guano had been accidentally spilled, but gathered up again as well as possible, and that the spot on which the guano fell was actually burnt up and the grass-root apparently destroyed. He likewise informs us that he cut a tuft of rushes close to the ground, and spread on it a handful of guano, and that the result was, the destruction of the rushes.

The two latter facts, coupled with the surmise as to the failure of some of the mangel wurzel seed, are worthy of attention, for if they can be relied on, guano has the additional advantage of being a destroyer of noxious vegetation. We may also here remark, that the Editor of the *Ayr Observer* informs us, that guano is utterly destructive of the *grub.*

We have been favoured with the following important letter on the comparative Qualities and Prices of Peruvian and African Guano:—

Liverpool, April 3, 1844.

SIR,—Guano from the coast of Africa has of late attracted much attention in England, and although large sales have been made, yet we are led to suppose that its qualities and value are but imperfectly known. We have endeavoured carefully to investigate the subject, and now beg to submit the same to your notice:—

	Ichaboe.	Genuine Peruvian
Average result of various analyses made by Dr. Ure, gives of available matter		88 parts in 100
Mr. Hudson's analysis		86¾ ditto
Average	77¼	
Ditto Dr. Ure's	76	
The one may be compared to the other, as	7	to 8
Or in money	£8 15s	to £10
The weight is	8	to 9
Being a drawback to Ichaboe, as the consumer would be put to about 40 per cent. extra charges on carriage, labour, &c., to obtain equal quantity of available matter, consequently allowing the consumer 5s. per ton	£8s 10s.	to £10.
is what might be considered the relative value		

"How does the case stand at present?" We will take for instance, a sale from the ship's side of

100 tons genuine Peruvian Guano at £10 per ton	£1000		Available matter 800
Charges on ditto to consumer, say	50	£1050 0	
142 Tons 17 cwt. Ichaboe Guano, at £7 per ton	999 19		
Charges on ditto, say	70 0	1069 19	Ditto 999
		20 0	199

Showing clearly, under existing circumstances, that Ichaboe guano, to the consumer, is 23 per cent. cheaper than Peruvian.

That sufficient grounds exist to calculate a rise in price of this class would appear reasonable when its relative value becomes generally known, and more especially as 1500 or 2000 tons of the Peruvian to arrive are already sold, as also the sale of this class being solely in the hands of one or two firms, the price is likely to be sustained.

It may be stated, on the other hand, that the number of vessels now loading, and many on their way, will keep prices down, which may for a time prove the case so much the more favourable for such parties who might be inclined to invest money in the article by buying to arrive at a low figure that from Ichaboe, with, "if possible, the option of sending the vessel to discharge at any port in the United Kingdom, The following calculations will show the relative value to the agriculturist of the different qualities of guano hitherto brought to this country, and will also enable the shipowner to see at a glance the description that will answer best to import:—

Description.	Comparative weight	Available matter	Tons, cwts, &c	At per ton	Amount	Contains available matter	Supposed labour and charges	Total cost	Rate cost of labour per ton	Say	Consequent relative value
Genuine Peruvian	838	88	100 0 0 0	£10 0 0	£1000	8800	£100 0 0	£1100 0 0			£10 0 0
Ichaboe ..	806	77	114 5 2 24	8 15 0			114 5 5	1114 5 5	2s 10d	3s 0d	8 12 0
Angra Pequena	990	69	127 13 2 26	7 16 6			127 10 9	1127 10 9	5 6	5 6	7 11 0
Possession Island	1018	61	144 5 1 0	6 18 7			144 5 3	1144 5 3	8 10	9 1	6 9 6
Puerto Cabello	873	57	154 7 2 24	6 9 5			154 7 6	1154 7 6	10 10	11 0	6 18 6

Guano is now in such extensive use, and daily getting more and more so, that we should not be surprised, before two years are over, that the shipping interest of the country will have received almost equal advantage from that source as the agricultural.

Before, however, dismissing the subject, we would direct the attention of all parties to the under-mentioned places, at some of which we are fully aware that guano is to be met with:—The Islands in the Gulfs, Port Adelaide; the Bird Islands, St. Lawrence Gulf; Labrador and Newfoundland Coasts; Islands of Aves, Sombrero, and Tobago, West Indies; Islands of Ascension and Rocks of St. Paul, near the Line; East Coast of South America, parallel with the West, from whence it is brought.

We are, Gentlemen, yours very respectfully,

CARSON & KILGOUR, Brokers,
7, EXCHANGE BUILDINGS

OBSERVATIONS ON SOUTH AMERICAN & AFRICAN GUANO.

By *JOHN DAVY, M.D., F.R.S., London and Edinburgh.*

[Abridged from the Edinburgh New Philosophical Journal, No. 72.]

At the present time, when the attention is so much given to agricultural improvement, and such great exertions are making to increase the productiveness of our own soil, to meet, as it is to be hoped, foreign competition, the discovery of great deposits of concentrated manure, such as the guano is, may be considered as peculiarly fortunate and encouraging.

As we have few or no good accounts of the localities, and as they are very curious and peculiar, I shall insert a description of one instance in particular—viz., that of an islet from which some African guano was taken, the composition of which I shall have to notice further on.

"The island from whence the guano is taken is about three miles from the shore, on the south-west coast of Africa. It is a barren rock, about a mile in circumference; has no soil, or the least sign of vegetation. The guano lies to the depth of about twenty feet, and without any variation in quality. The continent is very sandy, and in high winds (hurricanes, for instance,) will cover a ship's deck nearly 100 miles from the land. The birds on the island are a kind of penguin, and cannot fly to any distance, if at all, their wings being a kind of fin. It is believed that the captain of the vessel who brought the guano was the first human being who set foot on the island, which is very difficult to approach, there being no harbour and a heavy surf. On walking on it, he could scarcely set his foot without treading on the birds, and they took no notice whatever of him, except pecking at his feet, he being barefoot; and on a gun being fired, they merely fluttered a good deal, and made much noise. There is no fresh water, it is believed, for some hundreds of miles along the coast, and no rain."

For this interesting and simple account I am indebted to a friend, who obtained it from the merchant, the importer of the guano.*

As, in consequence of the increasing demand for guano, and its

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* Mr. John Rae, South Castle Street, Liverpool.

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high price as a manure, there is great temptation to adulterate it, or impose a spurious compost in imitation of it; and which, indeed, is said to be practised already to a considerable extent, any precise information respecting the genuine article can hardly fail to be useful. With the hope of contributing something of this kind, I have examined both the American and African guano, comparing them together, and I shall now briefly state the results, premising a slight notice of their appearance.

Both, when moist or damp, as when imported, and offered for sale, are of a pretty dark reddish brown colour, very like that of dark moist snuff. In drying both become of a lighter hue, and the African kind, on exposure to the air, soon exhibits a white efflorescence. Both when moist exhale a strong ammoniacal odour (the African the strongest), mixed with a different and peculiar smell, somewhat offensive, which, with the ammoniacal, they in a great measure lose in drying.

Under the microscope, using a high power, both appear to consist chiefly of very minute granules, many of them smaller than the blood corpuscles, and of slender prismatic crystals of oxalate of ammonia, in which the African kind is most abundant.

Subjected to chemical analysis, the two kinds (No. 1 the American, No. 2 the African,) have appeared to consist of—

	No. 1	*No.* 2
Matter soluble in water, destructible by fire, or volatile, such as oxalate of ammonia, diphosphate and muriate of ammonia, and animal matter	41·2	40·2
Matter not destroyed by fire, nor soluble in water, or very slightly so, chiefly phosphate of lime and magnesia, with a little sulphate of lime, and a very little siliceous sand	29·0	28·2
Matter not destroyed by fire, but soluble in water, chiefly common salt, with a little sulphate and sesquicarbonate of potash	2·8	6·4
Matter destructible by fire, little soluble in water, chiefly lithate of ammonia	19·0	—
Matter expelled in drying on a steam bath, chiefly water and sesquicarbonate of ammonia	8·0	25·2
	100·0	100·0

As regards the American guano, the results of this coarse analysis do not disagree with those of the more minute one of Volckel, excepting in one particular: he obtained 7 per cent of oxalate of lime, a salt which certainly did not exist in the specimen which I examined; and this I say, after having carefully sought for it.

Comparing the constituents as they are placed side by side of the

American and African guano, the chief difference seems to be, that while the American kind contains a large proportion of lithate or urate of ammonia, the African kind is totally destitute of it. This I little expected, considering its origin, the excrement of birds, their fæces and urine, the latter of which commonly consists chiefly of lithate of ammonia. The obvious explanation of this circumstance is, that the lithic acid, which formed a part of the urine, has in a long period of time suffered decomposition, and has given rise to oxalate of ammonia. And, that this guano is very old, was indicated by the partially decomposed state of some feathers, not excepting the quills, which were included in it. I have said, that the African guano is totally destitute of lithic acid; and I believe I am warranted in coming to this conclusion, having carefully sought for it in vain. It may be mentioned that search also was made in both kinds of guano for urea, but without well-marked success. The brown animal matter, soluble in water, yielded a small portion to alcohol, which had some of the properties of urea, and formed a compound with nitric acid, but less distinctly crystalline than the nitrate of urea.

Before concluding, I would wish to say a few words relative to the tests of guano,—the means of distinguishing between the genuine and the spurious kinds. Taking into account its origin, and that deposits of it can be found only where no rain falls, the inference seems now to be obvious, either, if old, that it must abound in oxalate of ammonia; or if comparatively of little age, in lithate of ammonia; or if not of great age, it must contain a notable quantity of both these substances. These salts are easily detected, and the first mentioned, very readily by the microscope.

The adulteration of the genuine kinds, to which the temptation is great, cannot be so easily detected. I fear it cannot be accomplished, excepting by means of chemical analysis, and that the farmer must hold himself dependant on the integrity of the merchant, and if he would wish to avoid the chances of imposition, he must purchase only of the merchant of established name, and at the regular price.

As guano appears to be constantly exhaling ammonia on exposure to the atmosphere, to prevent loss and deterioration, it cannot be, before use, be too carefully excluded from the air, and on the same account, it ought not to be applied as a manure whilst vegetation is inactive, but rather at the moment of its coming into activity, and when in progress, according to the Peruvian manner of bestowing it on the plant, rather than on the soil.

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